SUPPORT FOR THE AMENDMENTS

Newly-added Claims 41-59 are supported by the specification and the original claims. No new matter is believed to have been added to the present application by the amendments submitted above.

REMARKS

Claims 41-59 are pending. Favorable reconsideration is respectfully requested.

Applicants would like to thank Examiner Roland for the helpful and courteous discussion held with their representative on January 24, 2011. During the discussion, the claim amendments presented above were discussed. The following remarks expand on the discussion with the Examiner.

The present invention relates to a phase-change memory cell, comprising:

between two electrical contacts, a portion in a memory material with an amorphous-crystalline phase-change and vice versa, as a stack with an active central area located between two passive outmost areas; and

an interface between the active central area and each passive outmost area, each passive outmost area being made in a material having a melting temperature higher than that of the material of the active central area, the material of the passive outmost areas having very low solubility or zero solubility in the material of the active central area, the material of the passive outmost areas being a chalcogenide having the same chemical nature with a different composition of those of the material of the active area, the interface being inert or quasi-inert from a physico-chemical point of view even during a writing operation of the phase-change memory cell.

See Claim 41.

The rejections of the claims under 35 U.S.C. §103(a) over Holmberg and Klersy and further in view of Tanaka and Petrov are respectfully traversed. The cited references fail to suggest the claimed phase-change memory cell.

As noted by the Examiner, Holmberg does not disclose that the interface is inert or quasi-inert from a from a physico-chemical point of view. During the discussion on January 24, 2011, the Examiner requested that Applicants provide an explanation of why the interface in Holmberg is not, in fact, inert or quasi-inert from a from a physico-chemical point of view. This explanation is provided below.

In Holmberg figure 3, the active central layer 29 is of an amorphous material with approximately 15-17 percent germanium although this percentage may vary from 10 to 25 percent.

The outmost layer 28 is of a germanium-tellurium composition with proportion of approximately 33 percent germanium although this percentage may vary from 25 to 45 percent.

The outmost layer 30 is in a tellurium rich material with 0 to 10 percent germanium the rest being tellurium.

Applicants note column 5, line 59 to column 6, line 4 of Holmberg. Figure 4A is a graph illustrating two states of the device. The solid line corresponds to a first state. The solid line illustrates the germanium concentration in atomic percentage as initially deposited for the structure of figure 3 as a function of the distance of the respective layers from the top of the positive electrode 23. This graph is in a stairs form with three steps. The first step on the left corresponds to layer 30, the middle step corresponds to layer 29 and the third step on the right corresponds to layer 28.

The dotted line corresponds to a second state. The solid line represents the composition distribution that is formed after the device has been operated for many set reset cycles. The steps have disappeared. It means that the composition distribution has changed between the first state and the second state. If the composition has changed, it means that the

interface between the central layer and each outmost layer is not inert or quasi inert from a physical-chemical point.

Figure 4B also illustrates this phenomenon. The solid line corresponds to the first state. It illustrates the melting temperature distribution in the three layers at the beginning. Again the dotted line is the melting temperature distribution in the three layers after many set-reset cycles. The solid line and the dotted line have not the same shape, it means that the melting temperatures in the three layers have changed and that the compositions have also changed.

Klersy discloses to realize the passive outmost areas 1b, 5b in amorphous carbon (see column 6, lines 21-23). The layer 1b, 5b serve as barriers between the threshold switching material and the electrodes (see column 9, line 40-46). It is mentioned that the thin films of carbon are believed to provide superior barrier between the body of chalcogenide material (the active central area) and the electrodes.

The last paragraph of column 9 mentions that other barrier materials known to those of ordinary skill in the art, and which are substantially inert with respect to the body of chalcogenide material 3. But Klersy is silent on the type of the suitable barrier material. Before the present invention date, the known barrier materials were nitride.

A person skilled in the art wishing to improve cyclability and ageing of a phase change memory cell would not be incited to use for the passive outmost areas a chalcogenide having the same chemical nature with a different composition of those of the material active area in order to have an inert or quasi inert from a physic-chemical point of view even during a writing operation.

Holmberg discloses a chalchogenide but with such chalchogenide the interface is not inert or quasi inert. Consequently, the person skilled in the art will be incited to change the material of the passive outmost areas. But Klersy does not give him the solution. Klersy does not cite suitable inert materials.

Tanaka and Petrov have been cited with respect to the subject matter of Claim 25. Neither of these references remedy the deficiencies of over Holmberg and Klersy discussed above.

In view of the foregoing, the combinations of Holmberg and Klersy and further in view of Tanaka and Petrov fail to suggest the claimed phase-change memory cell. Accordingly, the subject matter of the pending claims is not obvious over those references. Withdrawal of these grounds of rejection is respectfully requested.

Regarding the Restriction Requirement, Claims 42-59 depend directly or indirectly from Claim 41. Since Claim 41 is allowable for the reasons described above, those dependent claims are allowable as well. Accordingly, rejoinder of all of the claims is requested.

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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